MOORE HAWKE
FIELDBUS WORLDWIDE

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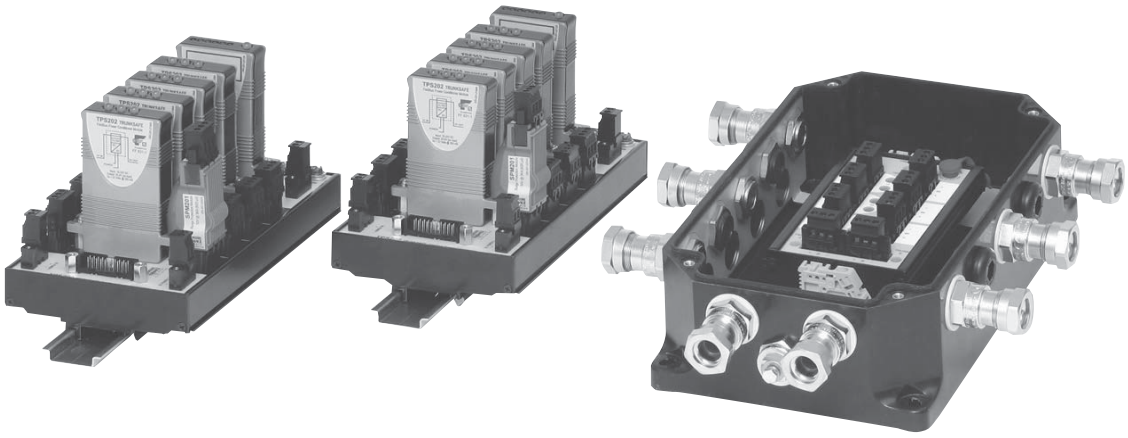
TS Series

TRUNKSAFE® *Fault Tolerant Fieldbus System*



TS Series ***TRUNKSAFE®*** *Fault Tolerant Fieldbus System*

Table of Contents

Introduction 3

TRUNKSAFE System Configuration 4

Specifications 5

Dimensions 6

Installation 9
- TPS201-4 DIN Carrier Units 9
- TPS202 Advanced Power Conditioner 9
- FDM252 Fieldbus Diagnostics Module 9
- SPM201 Surge Protection Module 10
- TS200 Series Device Couplers 10

Terminal Designations 11
- Wiring Connections 12
- Terminator 12

Grounding 13
- Case Ground 13
- Shield Ground 13
- Surge Ground 13
- TS200 Device Coupler 13

Recommended Ground Wiring Practices 13

Troubleshooting 14
- LED Operation 14
- CE Conformity 15

Operation 15
- Maintenance 15

Customer Support 15

Control Drawings 16

HOST Interface Kits 18

Appendix A: TRUNKSAFE / Emerson DeltaV System Configuration 18

Appendix B: TRUNKSAFE / Yokogawa CENTUM System Configuration 20

Appendix C: TRUNKSAFE / ABB System 800 Configuration 21

Appendix D: TRUNKSAFE / Honeywell System Configuration 22

Appendix E: TRUNKSAFE / Invensys System Configuration 23

Appendix F: TRUNKSAFE / Profibus System Configuration 24

Declaration of Conformity 25

Return and Warranty Procedures 26

Introduction

The TPS200 TRUNKSAFE Fault-Tolerant Fieldbus System enables fault-tolerant FOUNDATION fieldbus H1 and PROFIBUS PA segments. TRUNKSAFE works with any Host configuration using a simplex or redundant interface. A secure fieldbus physical layer is made possible through the combination of a Host Interface Kit, two redundant fieldbus DC Power Conditioners and the specially engineered TRUNKSAFE Device Coupler. This ensures that TRUNKSAFE will maintain normal segment communications even in the event of Host interface failure[1], power conditioner failure or an open- or short-circuit of any cable between the Host Interface and the field based device coupler.

TRUNKSAFE is FOUNDATION fieldbus ® registered and fully compliant with FF831-1 (the technical specification for fieldbus power supplies) and FF846-1 (the technical specification for device couplers).

TRUNKSAFE is fully compliant with IEC61158-2, the fieldbus physical layer standard, and requires no modifications to fieldbus devices or to Host software.

TRUNKSAFE System Configuration

Figure 1 shows a TRUNKSAFE system configuration and illustrates how TRUNKSAFE maintains continuous segment communications between the Host and field devices in the event of any single point failure, such as an open or short circuit.

(Refer to Appendices for specific Host wiring configurations. Contact MooreHawke if wiring configurations for alternative Host systems are required)

The TPS200 TRUNKSAFE Fault-tolerant Fieldbus System is comprised of three main sections: Host Interface, Power Conditioning, and a single field-based device coupler

[1]At time of this publication, PROFIBUS PA does not support redundant interface cards.

The Host Interface, which is unique to each Host vendor, provides two trunk outputs that will be carried all the way to the device coupler in the field. Typically this is done with redundancy adapters connected to the Host interface (See Appendices). Additional interface adapters (when needed) ensure that active modules can be replaced without shutting down communications. The resultant two trunk outputs begin the redundant segment, and are then wired to separate fieldbus power supply carrier boards. In most cases this is accomplished with a plug-to-plug cable connector carrying four segments.

Power conditioning is provided by the TRUNKSAFE fieldbus power supply which comprises a DIN Carrier (TPS201-4) populated with up to four Advanced Power Conditioner Modules (TPS202), optional surge protection (SPM201) and one Fieldbus Diagnostics Module (FDM252). Each trunk is connected to a separate carrier board (TPS201-4) of the TRUNKSAFE fieldbus power supply. Each carrier board supports four trunks with an individual power conditioning module (TPS202) and a segment terminator for each trunk.

A Fieldbus Diagnostics Module (FDM252) must be fitted onto the DIN Carrier (one Module mounted per Carrier) in order to provide alarm and diagnostics information. It provides LED indicators for DC power status, cable open- and short-circuits, noise on each segment and a common contact closure (opens upon alarm).

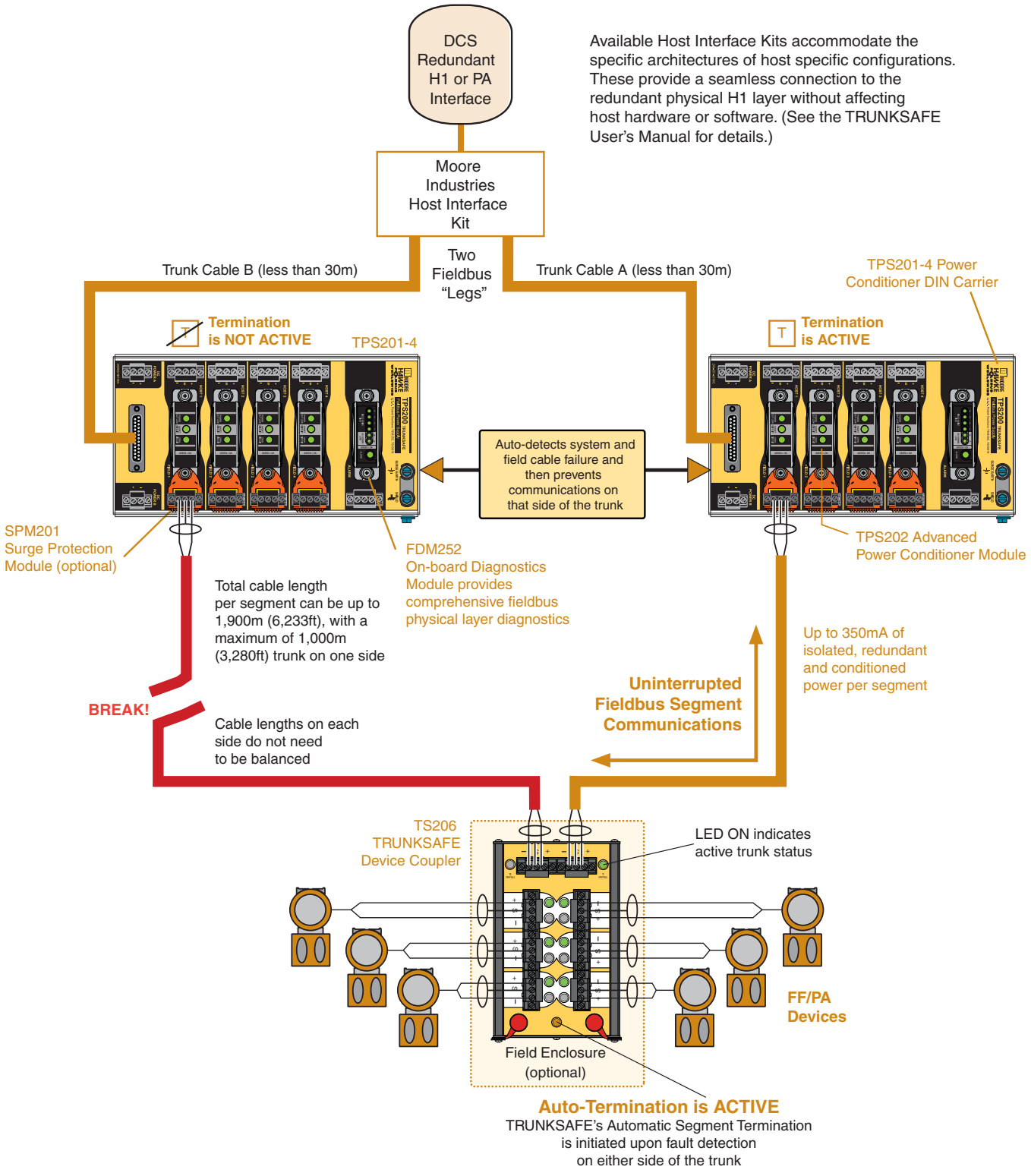
The optional Surge Protection Module, SPM201, provides a full 3-element surge suppression circuit per segment. The SPM201 fits directly onto the DIN Carrier pluggable terminal socket (field-side) for the segment being protected. This eliminates the need for additional panel wiring or mounting space. A ground connection for surge protection is provided through a bus bar located within the DIN Carrier. Ground is made externally available as a separate grounding stud.

The single field-based device coupler receives power and communications from each trunk. It can support up to 6 (6 way) or 12 (12 way) devices. The TS200 Series device coupler is a specially engineered device coupler with redundancy, automatic terminator, and spur short circuit protection built into the coupler. In addition, each coupler has led indicators for each trunk, spur (normal and short circuit) and auto-terminator.

TS Series

TRUNKSAFE® *Fault Tolerant Fieldbus System*

Figure 1. *TRUNKSAFE System Configuration - Redundant operation*


DCS Redundant H1 or PA Interface
Available Host Interface Kits accommodate the specific architectures of host specific configurations. These provide a seamless connection to the redundant physical H1 layer without affecting host hardware or software. (See the TRUNKSAFE User's Manual for details.)
Moore Industries Host Interface Kit
Two Fieldbus "Legs"
Trunk Cable B (less than 30m)
Trunk Cable A (less than 30m)
TPS201-4 Power Conditioner DIN Carrier
Termination is NOT ACTIVE
TPS201-4
Termination is ACTIVE
Auto-detects system and field cable failure and then prevents communications on that side of the trunk
SPM201 Surge Protection Module (optional)
FDM252 On-board Diagnostics Module provides comprehensive fieldbus physical layer diagnostics
TPS202 Advanced Power Conditioner Module
Total cable length per segment can be up to 1,900m (6,233ft), with a maximum of 1,000m (3,280ft) trunk on one side
Up to 350mA of isolated, redundant and conditioned power per segment
BREAK!
Cable lengths on each side do not need to be balanced
Uninterrupted Fieldbus Segment Communications
TS206 TRUNKSAFE Device Coupler
LED ON indicates active trunk status
FF/PA Devices
Field Enclosure (optional)
Auto-Termination is ACTIVE
TRUNKSAFE's Automatic Segment Termination is initiated upon fault detection on either side of the trunk

Specifications

TPS201-4 Power Conditoner DIN Carrier

Performance	**Number of Segments:** 4 **Supply Voltage:** 19.2 to 32Vdc, reverse polarity protected
Terminals	**Type:** Removable terminals with screw-clamp retaining screws **Wire Size:** Handles 0.8-2.5mm^2/12-24AWG cable sizes

TPS202 Power Conditioner Module

Performance	**Output Capacity:** 350mA per segment; up to 25.5V (no load) **Power Requirements:** 13.5VA @350mA per segment **Power Dissipation:** 5.5W @350mA per segment **Terminator:** 100 ohms/1microFarad per segment **DC/DC Isolation:** 500Vdc (segment to power supply)
Indicators	**LED (Power):** GREEN, normal; ORANGE, Output Voltage <18V **LED (Short):** GREEN, normal; RED, Cable Short **LED (Open):** GREEN, normal; RED, Cable Open

FDM252 Fieldbus Diagnostics Module

Performance	**Power Dissipation:** 0.5W maximum
LED Indicators	**LED Type:** GREEN, Normal; RED, Fault **LED A:** DC “A” Input Voltage Low (<18V) **LED B:** DC “B” Input Voltage Low (<18V) **LED 1:** Segment #1 Noise High (>75mV p/p) **LED 2:** Segment #2 Noise High (>75mV p/p) **LED 3:** Segment #3 Noise High (>75mV p/p) **LED 4:** Segment #4 Noise High (>75mV p/p)
Alarm Relay Output	**Type:** Relay (failsafe, open on alarm) **Contact Rating:** 5A@250Vac 50/60Hz or 24Vdc, non-inductive load

SPM201 Surge Protection Module

Performance	**Complies with:** -IEC 61158-2, for 31.25kB/s and testing according to -IEC 61643-21 **Maximum Surge Current Isn:** 20kA (8/20µsec) **Nominal Discharge Current Isn:** 3kA(8/20µsec) **Nominal Rated Current In:** 650mA **Maximum Continuous OperatingVoltage (MCOV):** 35V **Peak Common Mode:** 230V **Limiting Voltage Vlim:** 50V@3kA (8/20µsec) **Nominal Voltage Vn:** 32V **Line Attenuation:** Rs: 1 ohm capacitance:1nF **IP Rating:** IP20
Ambient Conditions (All TPS400 Components and Options)	**Operating Range:** –20°C to +60°C (–4°F to +140°F) **Storage Range:** –40°C to +85°C (–40°F to +185°F **Relative Humidity:** 0-95%, non-condensing **RFI/EMI Immunity:** 10V/m@80-1000MHz, 1kHz AM when tested according to IEC61326

TRUNKSAFE Fieldbus Device Coupler (TS200)

Communications	**FOUNDATION Fieldbus™ H1 or PROFIBUS PA**
Performance	**Maximum Quiescent Current:** TS206: 13.5mA TS20W: 25mA **Maximum Spur Output Current:** I_{Slim}=48mA **Spur Short Circuit Load:** I_{Ssc} 2mA (typical)/6mA max. **Spur Voltage Drop:** 0.5V@20mA spur current (typical), 1V maximum **Maximum Spur Voltage:** 24V max. no load
LED Indicators	**Trunk:** GREEN (Active); OFF (Inactive) **Spur:** GREEN (Normal); RED (Fault) **Auto-Terminator:** YELLOW (Terminator On); OFF (Terminator Off)
Terminals	**Type:** Removable terminals with screw-clamp retaining screws Wire Size: Handles sizes between 0.8-2.5mm^2/12-24AWG
Enclosures (Optional)	**Type:** Aluminum IP66; Stainless Steel 316 IP66; GRP (Glass Reinforced Polyester) IP66
Cable Gland (Device Couplers with Enclosures)	**Type:** Armored/ Unarmored **Material:** Nickel-plated brass
Ambient Conditions	**Operating Range:** –40°C to +70°C (–40°F to +158°F) **Storage Range:** –40°C to +85°C (–40°F to +185°F) **Relative Humidity:** 0-95%, non-condensing **RFI/EMI Immunity:** 10V/m@80-1000MHz, 1kHz AM when tested according to IEC61326

Dimensions

Figure 2. *TPS201/202 Advanced Power Conditioner and Generic Redundancy Adapter with DIN-Rail Mounting Installation Dimensions*

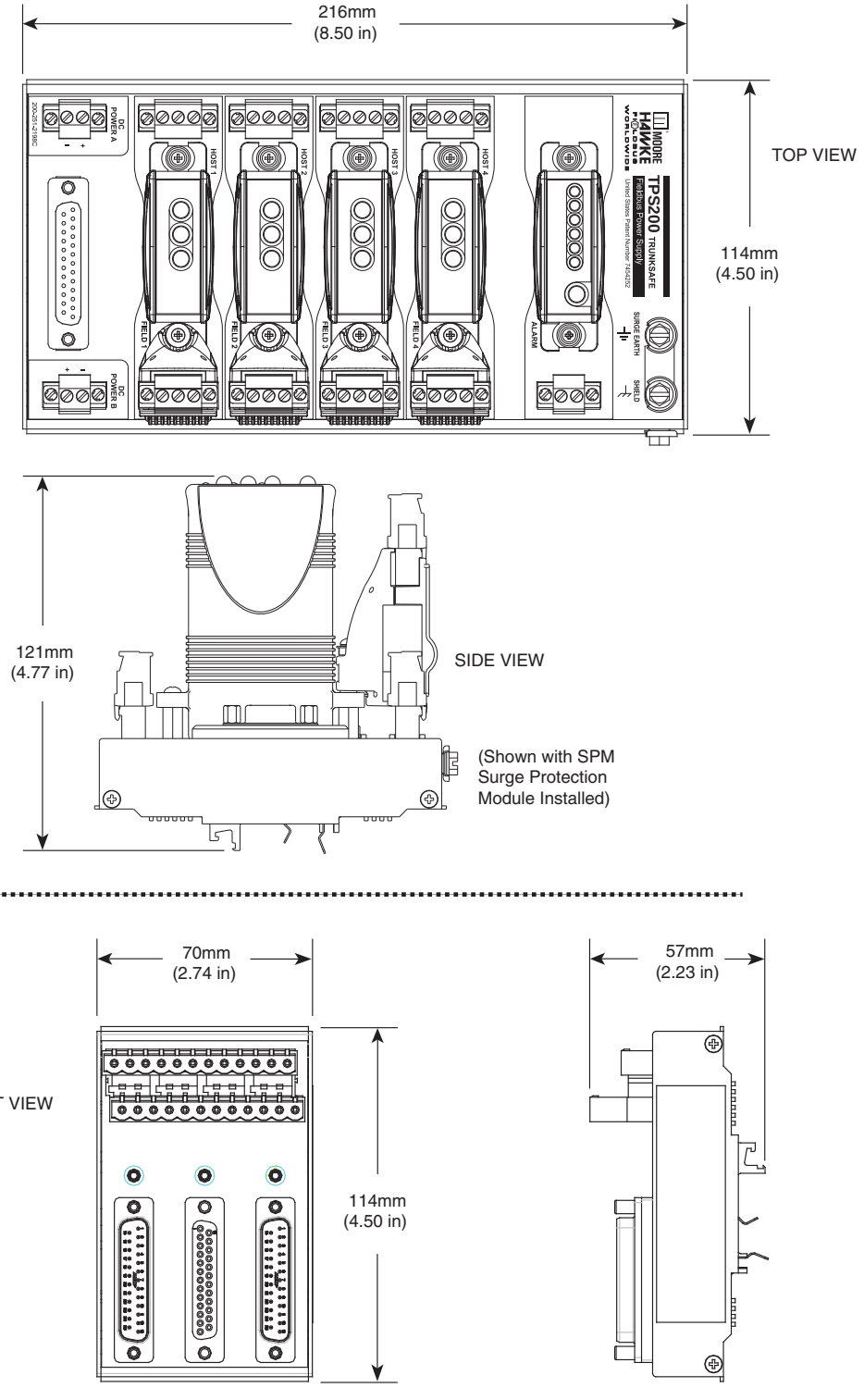


Figure 3-A. *TS200 Device Coupler DIN-Rail Mounting Installation Dimensions (Base Unit)*

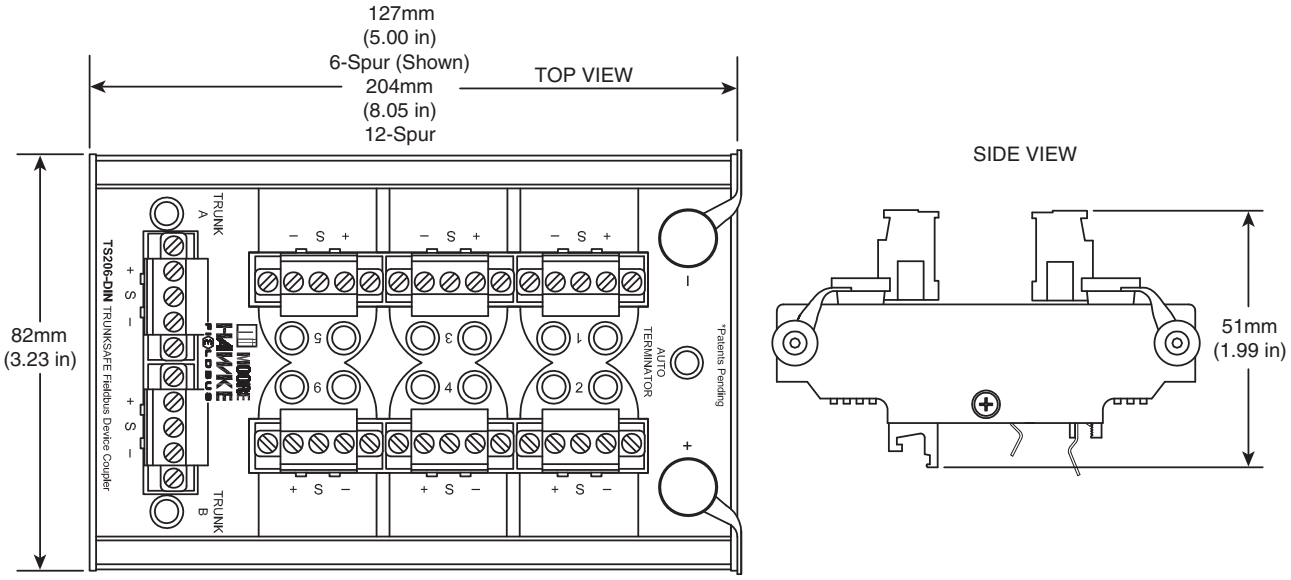


Figure 3-B. *DIN-Rail Mounting Installation Dimensions with Optional ATEX barrier*

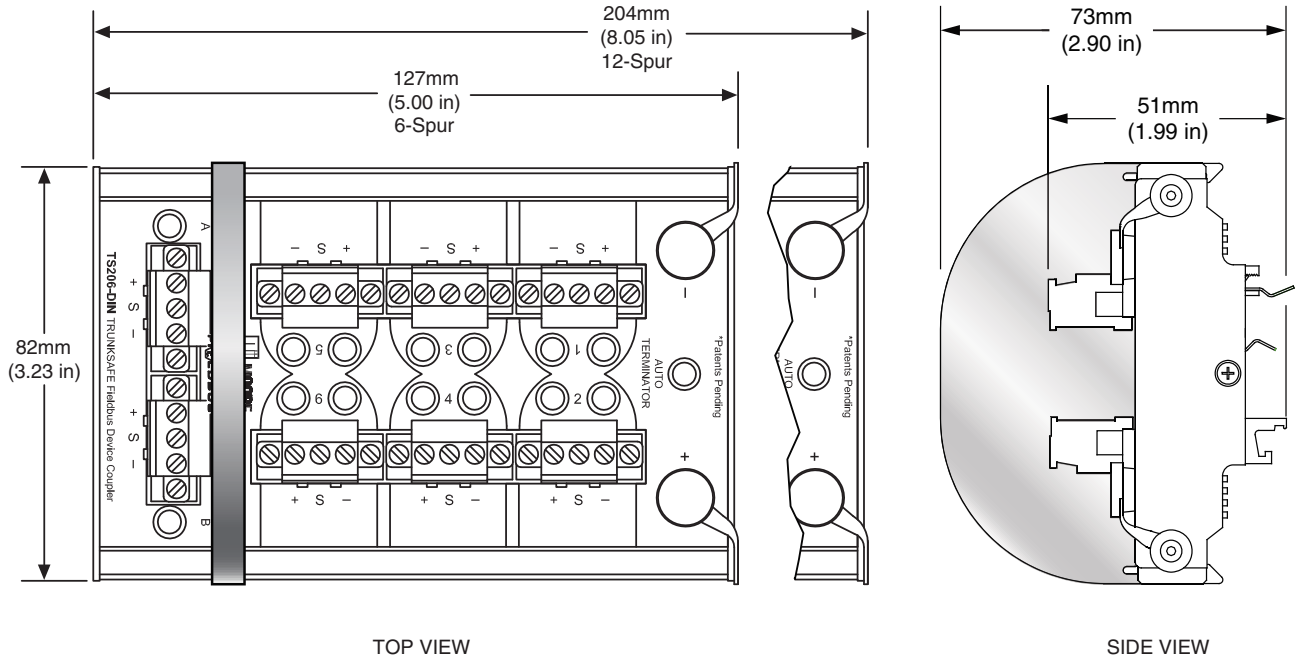


Figure 4. *Standard Aluminum Enclosure Installation Dimensions for 6-Spur (TS256) and 12-Spur (TS25W) Models*

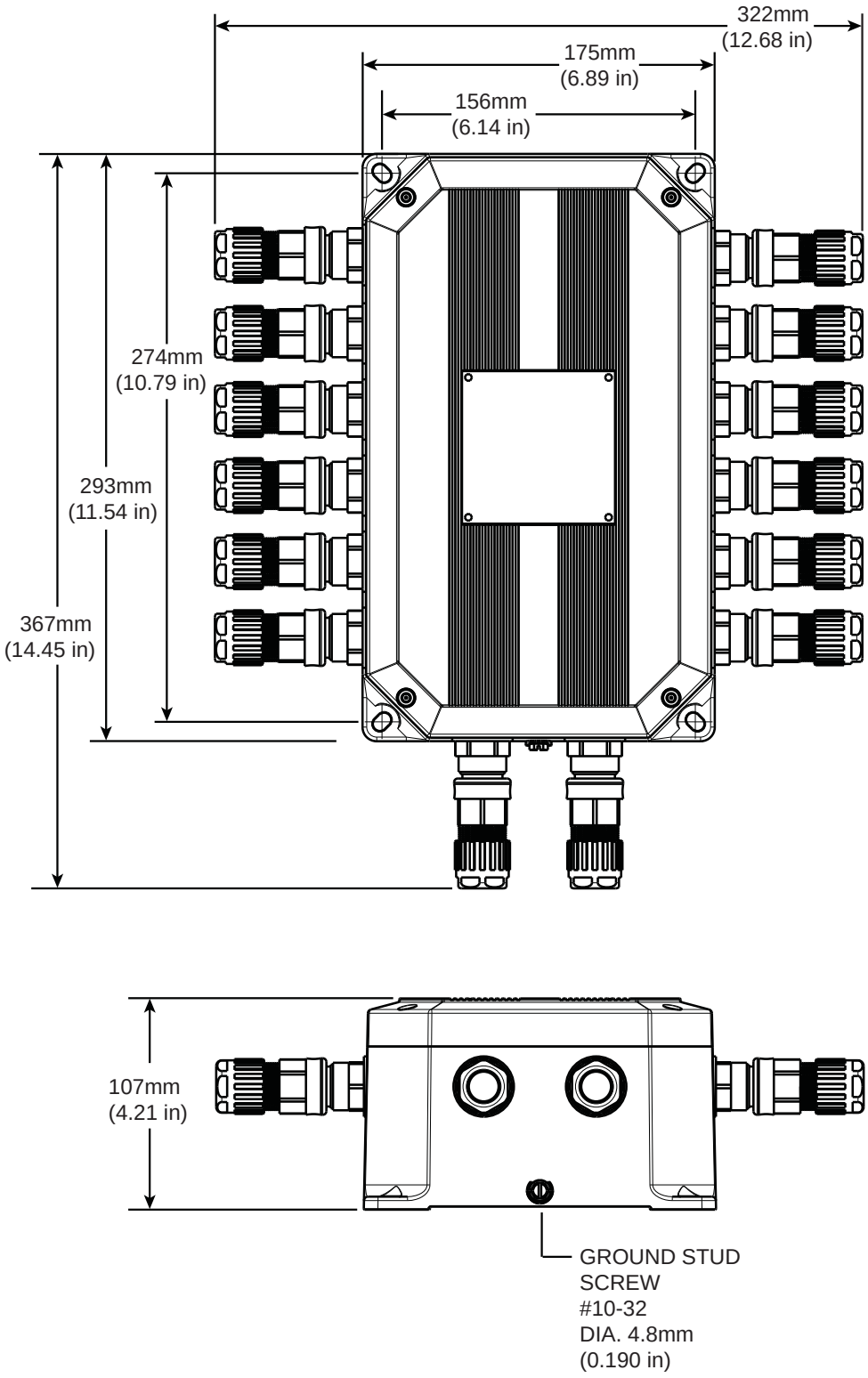


Figure 5. *Stainless Steel 316 with E-Z Vertically Removable Lid and Bottom Entry Cable Gland Plate 12-Spur Models (TS24W)*

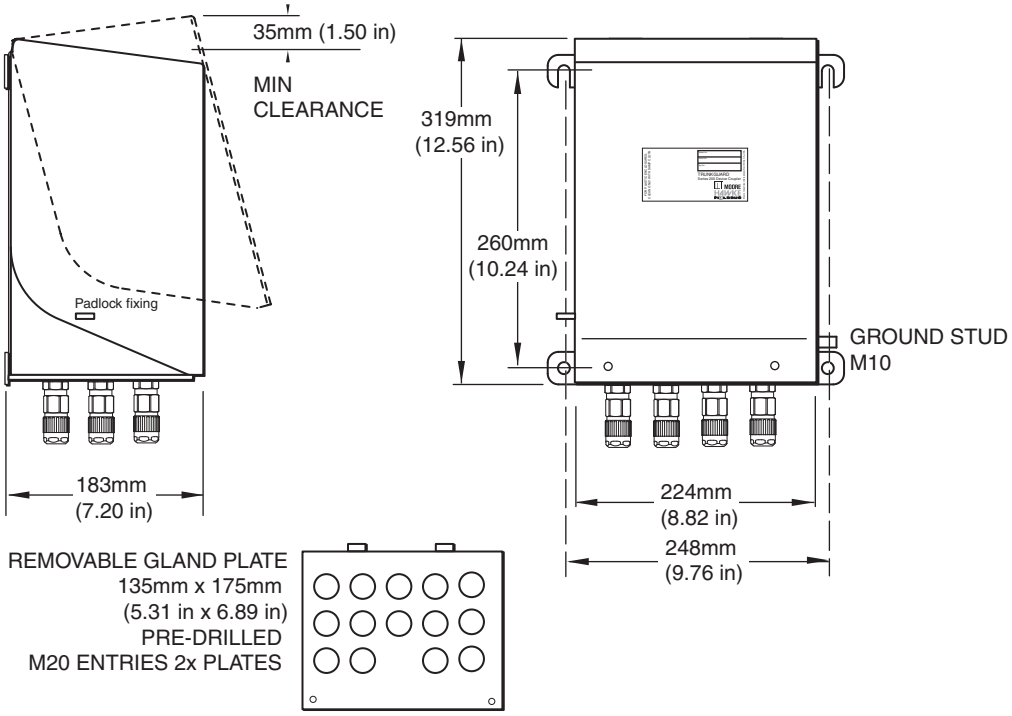
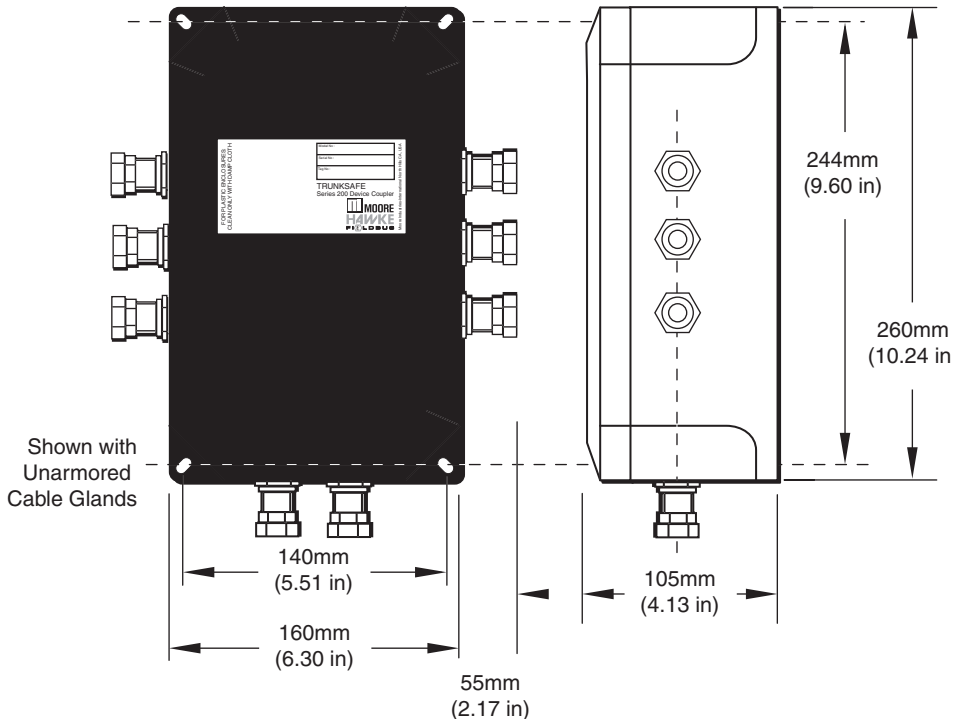


Figure 6. *GRP (Glass Reinforced Polyester) Enclosure Installation Dimensions for 6-Spur (TS236) Models*



Installation

TPS201-4 DIN Carrier Units

DIN Carrier Units fit onto 32mm (EN50035) G-type and 35mm (EN50022) Top Hat DIN-rails. They should be mounted in a way to allow easy access to terminal receptacles and to keep LEDs visible. Horizontal DIN-rails are preferred so that air can flow vertically between the Conditioners to assist in module cooling.

An outdoor location requires an external enclosure. Any enclosure meeting the requirements of the location in relation to electrical and mechanical safety can be used (a minimum of IP54 is recommended). Contact MooreHawke for specific advice regarding installation of TPS201 DIN Carriers in any hazardous area.

TPS202 Advanced Power Conditioner

Advanced Power Conditioners fit onto sockets on the Carrier face. They only mount in one orientation and should be secured to the Carrier using the on-board screws. For shipping purposes, a jumper is fitted to each socket. It must be removed prior to module installation. Should a Power Conditioner be removed, the Fieldbus Diagnostics Module will indicate an alarm.

FDM252 Fieldbus Diagnostics Module

Fieldbus Diagnostics Modules fit onto sockets on the Carrier face. They only mount in one orientation. Use the on-board screws to secure the module to the Carrier.

FDM252 Alarms

There are multiple reasons that a Fieldbus Diagnostics Module may alarm. See Testing and Trouble Shooting Section of this Manual for details. These include an error within your system.

Jumpers

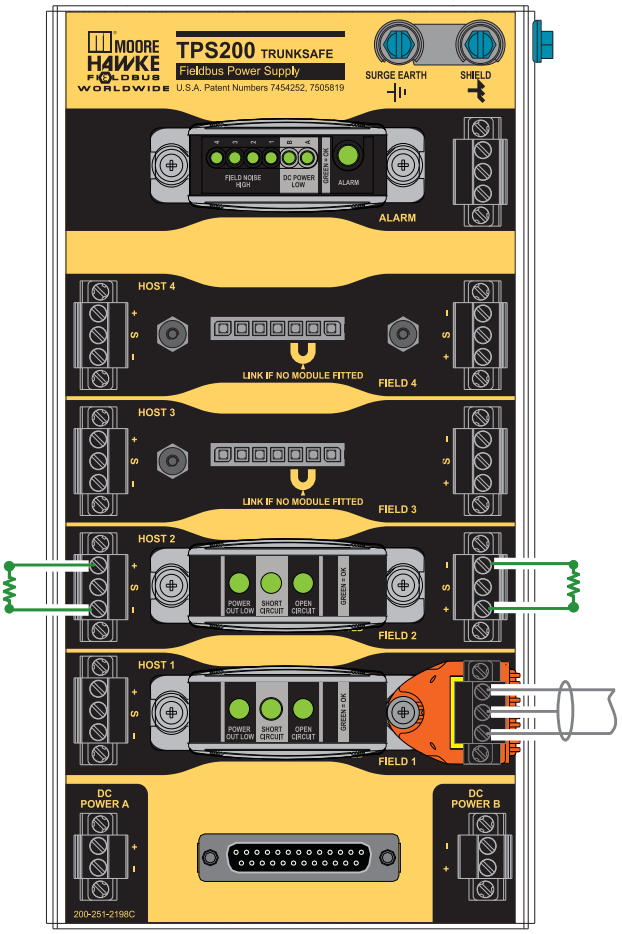
The TPS201 Carrier Module is shipped with jumpers fitted into the appropriate unused power slots (as marked). These jumpers must be placed (or retained) in any unused slot once the Carrier is used in an application, or else the alarm will be set on the Fieldbus Diagnostics Module. Extra jumpers are supplied in the TRUNKSAFE Kit, P/N: 208-265-00.

Resistors

Additionally, since the TPS202 continually monitors for open or short connections, if a TPS202 module is installed on the Carrier and is not being used in the system, the resistors provided (3.3kohm, 1W) in the TRUNKSAFE Kit, P/N: 208-265-00, must be placed on the Field and Host sides (at the + and – terminals not required on the Host side if DB25 cable is used and Interface/ Redundant adapter is connected) of that segment to prevent the Fieldbus Diagnostics Module from alarming. Resistors must be removed when the Trunk cables and Host wiring is added.

Resistors must also be placed on the field and Host side terminals for bench test purposes.

Figure 7. *Example of Jumper and Resistor Placement*



SPM201 Surge Protection Module

Surge Protection Modules (optional component) fit onto the field-side pluggable socket on the DIN Carrier face and accept the field-side pluggable terminals. They only mount in one orientation. A long screw is provided to secure the unit to the Carrier. This replaces the screw that is used to fasten the Advanced Power Conditioner modules to the Carrier face. It ***must*** be fitted in order to complete the ground connection of the Surge Protection Module.

TS200 Series Device Couplers

Device Couplers are typically located in the field. The TS200-DIN is supplied by MooreHawke for installation within a user-selected protective enclosure. Field-mounting enclosures along with cable glands/sockets can be ordered through MooreHawke. Refer to the TS Series data sheet for available enclosures.

Device Coupler location should be selected in order to allow easy access for field wiring but also to provide protection from mechanical damage or product spillage.

The Device Coupler should be secured to a DIN-rail and protected from external factors with an enclosure meeting a minimum of IP54 and that adheres to the following:

1. The enclosure must be compliant with the requirements for Directive 94/9/EC, Category 3 G applications.

2. A minimum clearance of 1mm must be maintained between live parts and grounded metal.

3. If other electrical circuits are fitted into the enclosure, they must be approved for the hazardous area. See Control Drawing 100-100-79 for further enclosure requirements.

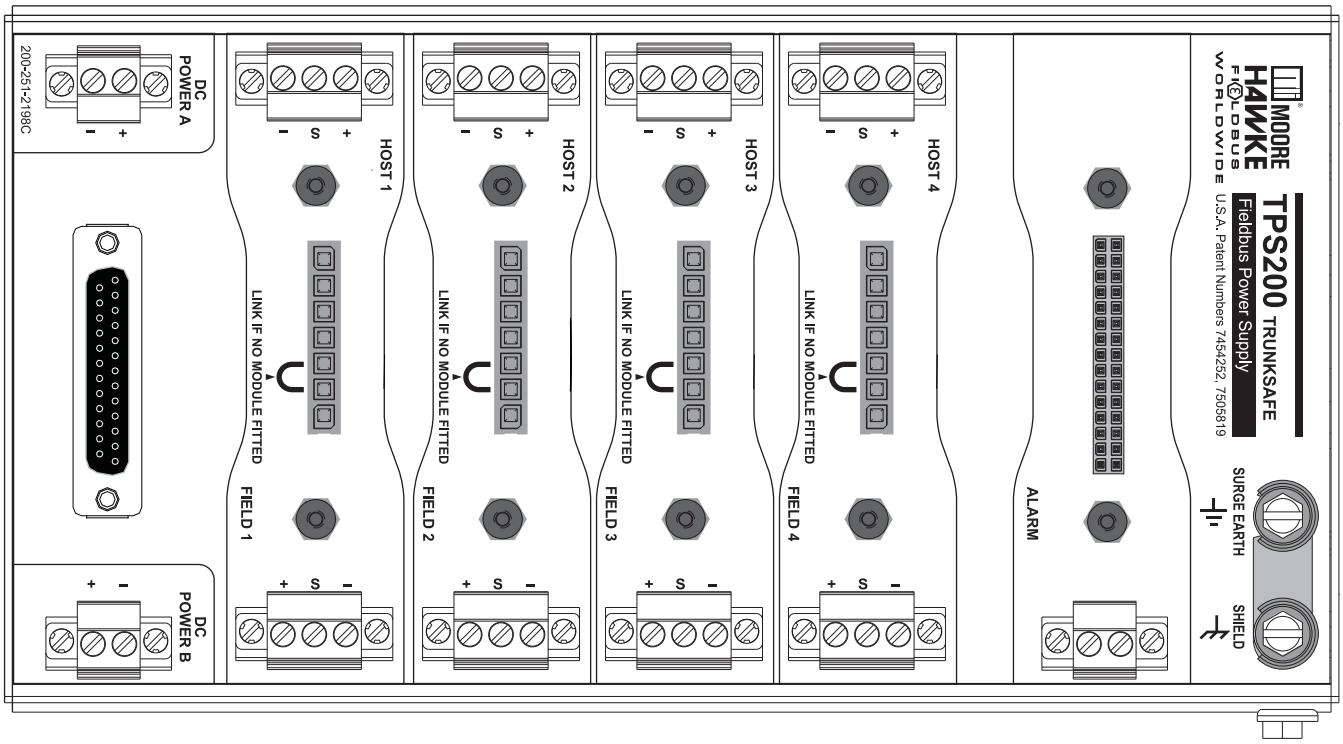
TS200 Series Device Couplers with MooreHawke-supplied external enclosures should be mounted to vertical surfaces in an orientation that prevents cable entry from above. Cables connected to all external enclosures should be oriented to prevent water running down the cable and into the enclosure entry. Cables approaching from above should continue down past the Device Coupler for at least 250mm (10 in), and then return upwards to the cable entry. Cables should be externally supported within 250mm (10 in) of the cable entry itself, particularly if armored cable is used. All unused cable entries should be sealed (MooreHawke-supplied enclosures with cable glands incorporate IP66 seals on all entries as standard).

Installation in third-party enclosures (not supplied by MooreHawke) and in hazardous locations should meet the requirements and appropriate approvals of that particular location.

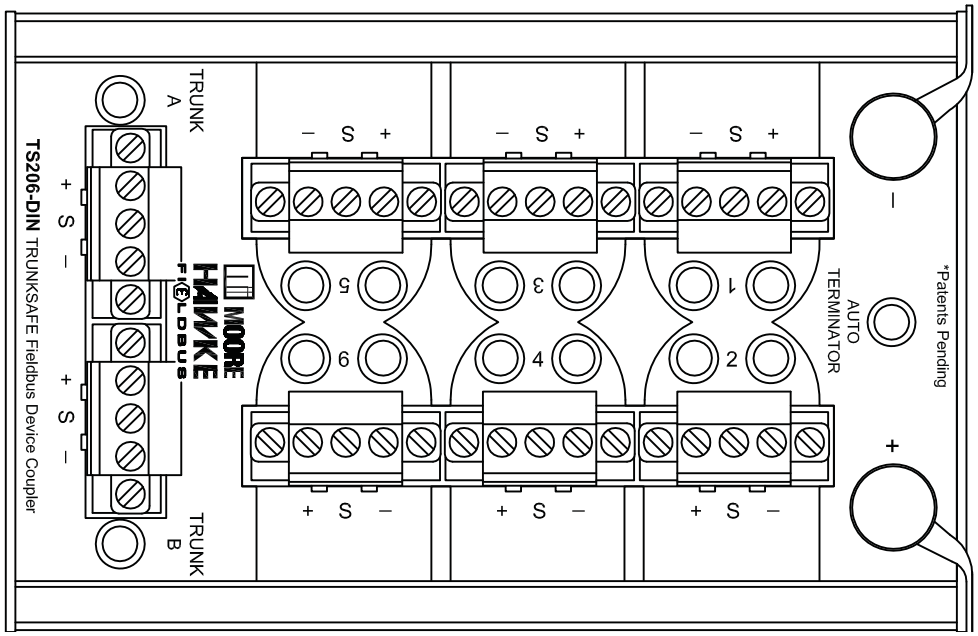
Please refer to TS200 ATEX and IECEx Certification section for more details.

Terminal Designations

TPS200



TS206 6-way shown below or TS20W 12-way



Wiring Connections

Each segment requires two independent field cables (typically called Trunk A and Trunk B). For maximum availability, each should have separate routing through the field until they meet at the TS200 Device Coupler. There is no need to balance the length of these two components, but the total length of all cables in any segment cannot exceed 1900m.

Any cable suitable for FOUNDATION fieldbus / PROFIBUS PA applications may be used. This is typically 18-22 AWG (0.8-1.5mm^2 cross-sectional area) cable with individual shields (normally called Type A cable). Components from multiple segments may be combined within a multi-core cable. If used, a separate multi-core shielded cable is required for both Trunk A and Trunk B cables. This is recommended in order to maintain separation of wiring. It is also recommended that various component shields remain independant of each other within the multi-core cable.

Wire terminations should be made from cables stripped to expose no more than 8mm (0.3 in) of conductor and inserted fully into the terminal opening. Bootlace ferrules are recommended for use with stranded cable. Field-side segment wiring is made via screw-clamp pluggable terminals marked FIELD. HOST connections are made either through the terminals marked HOST or via multi-way cables plugged directly to the header on the TPS201-4 Carrier board.

Nominal 24Vdc (19.2-32Vdc) power is required for terminals marked DC Power. Provisions are made for two independent DC feeds to the Carrier.

Note:

If only one DC power feed is to be used, a pair of jumper wires is required to the second set of DC feed terminals to ensure that the alarm monitoring circuit within the FDM252 (optional component) operates correctly.

At the TS200 Series Device Coupler, Trunk A and Trunk B are brought together and each Trunk is connected to one of the Trunk IN ports. The TS200 Series Device Coupler has a number of spur ports for the connection of field devices, depending on model. Wire terminations from field devices, including shield/ screen wiring, should be made (as described above) into the appropriate screw-clamp pluggable terminal. Only one field device should be connected per spur.

WARNING:

For -ATEX units used in Zone 2 applications: Only the pluggable connectors supplied with the unit can be used for spur connections. This ensures that spurs cannot be plugged into the trunk sockets.

Caution:

It is recommended that the shield from field devices NOT be connected to the field device case.

Once all wiring connections have been made, all retaining screws on each module should be securely fastened and any external enclosure closed (where applicable).

Terminator

In the TRUNKSAFE system, each trunk is terminated by a 100 ohm resistor in series with a 1uF capacitor, hard-wired at each Advanced Power Conditioner position. No terminator is required at the HOST H1 interface.Contact MooreHawke if the HOST link cable is in excess of 30m (100ft).

In normal operation the segment is “terminated” at each of the power conditioners. The terminator in the field based device coupler is only activated in the event of a fault (i.e., cable break, short, etc).

Grounding

The TPS200 carrier is provided with three independent connection points relating to ground. This section provides details of each connection point and provides recommendations on connecting these grounds.

Case Ground

The CASE ground connection is for personnel protection and should be connected to the local structural ground in the panel or enclosure, typically the incoming ac power ground, if available. The case can also be grounded via the DIN rail.

Shield Ground

The SHIELD ground is the collection point for all of the shields relating to the fieldbus signals (both field- and HOST-side). This may be directly connected to ground, through a capacitor or via the HOST ground.

Note:

If capacitor is not used, only one SHIELD ground is needed either at the power carrier or at the HOST top end. However, if it is at the power carrier, then connect SHIELD point to GROUND.

Surge Ground

The SURGE ground is available for those installations that use the SPM201 surge protection modules. These are designed to divert very large/short duration currents associated with surges (up to 20kA) and so these should not be connected to the normal SHIELD ground. When used for surge protection, the shorting bar between these ground points must be removed. Therefore, if no surge protection is being used, this shorting bar must be always connected to ground.

TS200 device coupler

The device coupler case should be grounded via the DIN rail.

Recommended Ground Wiring Practices

Moore Industries recommends the following ground wiring practices:

- Any MooreHawke product in a metal case or housing should be grounded.
- The protective earth conductor must be connected to a system safety earth ground before making any other connections.
- The maximum length of unshielded input and output signal wiring should be 2 inches.
- Some local electrical codes or facility practices may require the Shield to be connected to Ground at more than one location. Follow proper local guidelines.

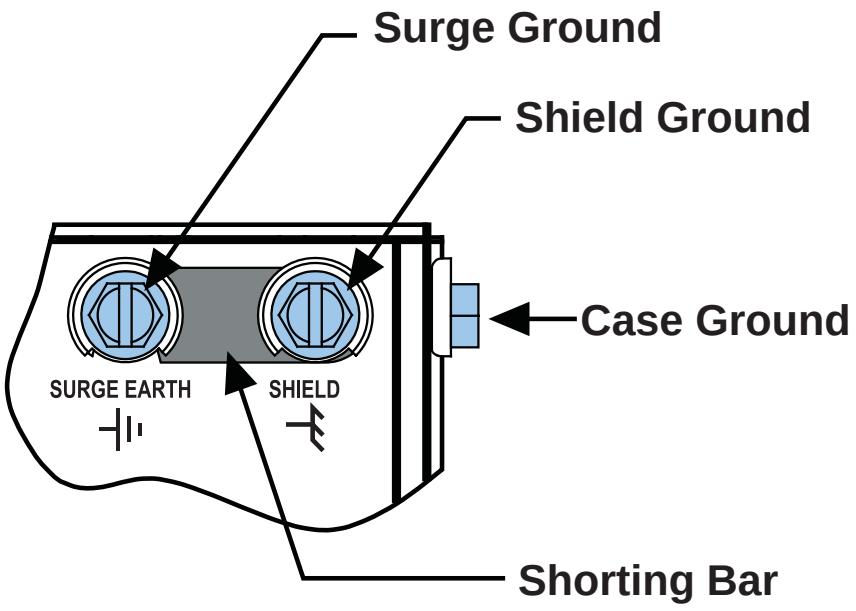
Fieldbus cable shields are “carried through” the Carrier’s input/output terminals and require a suitable, noise-free ground connection point. The selected point is generally the HOST power or I/O ground rail.

If SPM201 Surge Protection Units are fitted, their securing screw must be installed per unit and the TPS201-4 DIN Carrier must be connected to a low impedance surge protection ground with a direct cable of at least 10 AWG (10mm^2 cross-sectional area) from the grounding lug provided.

CE Conformity

Installation of any Moore Industries' products that carry CE certification (Commission Electrotechnique) ***must*** adhere to the guidelines in *Recommended Ground Wiring Practices* in order to meet the requirements set forth in applicable EMC (Electromagnetic Compatibility) directives 2004/108/EC, EN 61326. Consult the factory for the most current information on products that have been CE certified.

Figure 8. *Grounding options*



Testing and Troubleshooting

Refer to Table 1 for information on LED indications of fault conditions.

If the HOST cables are not connected to the HOST, or if Advanced Power Conditioners are installed and powered but with no device coupler connected, the Fieldbus Diagnostics Module will display a constant alarm. This alarm can be suppressed by installing load resistors (3.3kohm, 1W) into the pluggable terminals during commissioning.

Note that the DIN Carrier has a link fitted at each Power Conditioner position. The link must be removed prior to installation and must be replaced should a Power Conditioner be removed.

LED Operation

During normal operation, LED sequence should be as follows:

TPS202 Advanced Power Conditioners: All LEDs should be GREEN.

Note:

An open-circuit on the TPS202 can occur on the HOST or the field side of the segment. To determine which side is open, measure the voltage on the FIELD side connector. If the measured voltage is null, then the open circuit is on the field side. Alternatively, if voltage is present, then the open circuit is on the HOST side.

FDM252 Diagnostics Modules: All LEDs should be GREEN.

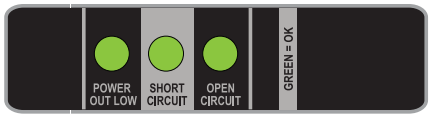
TS200 Series Device Coupler: All Spur LEDs should be GREEN.

If any RED LED is ON, or any GREEN LED is OFF, refer to Table 1 for troubleshooting tips.

In normal operation the Auto Terminator led will be off. It will only be on (YELLOW) if there is a Trunk failure (i.e., cable break, short, etc).

Figure 9. *Module LED Indicators*

TPS202



FDM252

Table 1. Troubleshooting

TPS202 Advanced Power Conditioner

LED	LED Indication		
POWER OUT LOW	GREEN	Amber	OFF
	Normal Operation	Output Voltage < 18V	Module failure
SHORT CIRCUIT	GREEN	RED	OFF
	Normal Operation	Cable short-circuit	Module failure
OPEN CIRCUIT	GREEN	RED	OFF
	Normal Operation	Cable open-circuit	Module failure

FDM252 Fieldbus Diagnostic Module

LED	LED Indication		
DC01	GREEN	RED	OFF
	Normal Operation	Input Voltage 1 < 18V	Module failure
DC02	GREEN	RED	OFF
	Normal Operation	Input Voltage 2 < 18V	Module failure
NOISE 1	GREEN	RED	OFF
	Normal Operation	Noise > 75mVp/p	Module failure
NOISE 2	GREEN	RED	OFF
	Normal Operation	Noise > 75mVp/p	Module failure
NOISE 3	GREEN	RED	OFF
	Normal Operation	Noise > 75mVp/p	Module failure
NOISE 4	GREEN	RED	OFF
	Normal Operation	Noise > 75mVp/p	Module failure

TS200-DIN Fieldbus Device Coupler

LED	LED Indication		
Trunk A	GREEN	N/A	OFF
	Normal Operation		**Loss of Power
Trunk B	GREEN	N/A	OFF
	Normal Operation		**Loss of Power
*Spur	GREEN	RED	OFF
	Normal Operation	Spur short-circuit	**Loss of Power
Auto Terminator	YELLOW	N/A	OFF
	Terminator ON		Terminator OFF

*Spur has two LEDs to indicate normal and fault conditions.
**Cable open- or short-circuit is due to loss of power.

TS200 ATEX and IECEx Certification

Special Conditions of Certification

The Model TS206 and Model TS2W Device Couplers shall be powered by the Moore Industries Model TP202 Power Supply.

When the TS200 device coupler is installed as Category 3 equipment, it shall be installed in an enclosure which maintains an ingress protection rating of IP54 and meets the enclosure requirements of EN60079-0 and EN60079-15 (IEC 60079-0 and IEC60079-15 for IECEx).

ATEX Zone 2 only:

Legacy systems installed prior to May 1st, 2013 may install replacement TS200 units with energy limited spurs using installation diagram on page 2 of 100-100-76.

All new ATEX Zone 2 installations or system expansions after May 1st 2013 must use intrinsically safe wiring for spur circuits per installation diagram 100-100-79.

Operation

Once configured, installed and supplied with the correct power, TRUNKSAFE begins to operate immediately.

Maintenance

Moore Industries suggests a quick check for terminal tightness and general unit condition every 6-8 months. Always adhere to any site requirements for programmed maintenance.

TPS200 Series modules contain no user-serviceable parts. Non-functioning units under warranty should be returned to Moore Industries for replacement or repair.

Due to the nature of materials used to manufacture the TPS200 Series Power Conditioners and TS200 Series Device Couplers the user/installer should exercise caution with regard to possible attack by aggressive substances in any specific installation.

Customer Support

If service assistance is ever required for an device in your application, refer to the back cover of this manual for the telephone numbers to Moore Industries' customer service department.

If possible, make a note of the model number of the unit before calling. For fastest assistance, have the following information available: serial number, the job number and purchase order number under which it was shipped.

MOORE INDUSTRIES

DO NOT SCALE DRAWING

TOLERANCES (UNLESS NOTED)	
DECIMALS	=±Inch /mm
.X	=±.1 /2.54
.XX	=±.01 /0.25
.XXX	=±.005/0.125
HOLES	=±.003/0.080
ANGLES	=±1/2°

DRAWN	C. Whan	6/09
CHECKED	VG	6/09
ENGINEER	H. Elsayed	6/09
SCALE	NONE	

CATEGORY: CONTROL DRAWING

TITLE: Field Installation Diagram: TS200 Device Coupler – cFMus –

DRAWING NUMBER: 100-100-76 SHEET 1 OF 2

REVISION: B

REVISED BY	DATE	BY	APPROVAL
ECO 16973	9/13	CW	CAB

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UNCLASSIFIED LOCATION

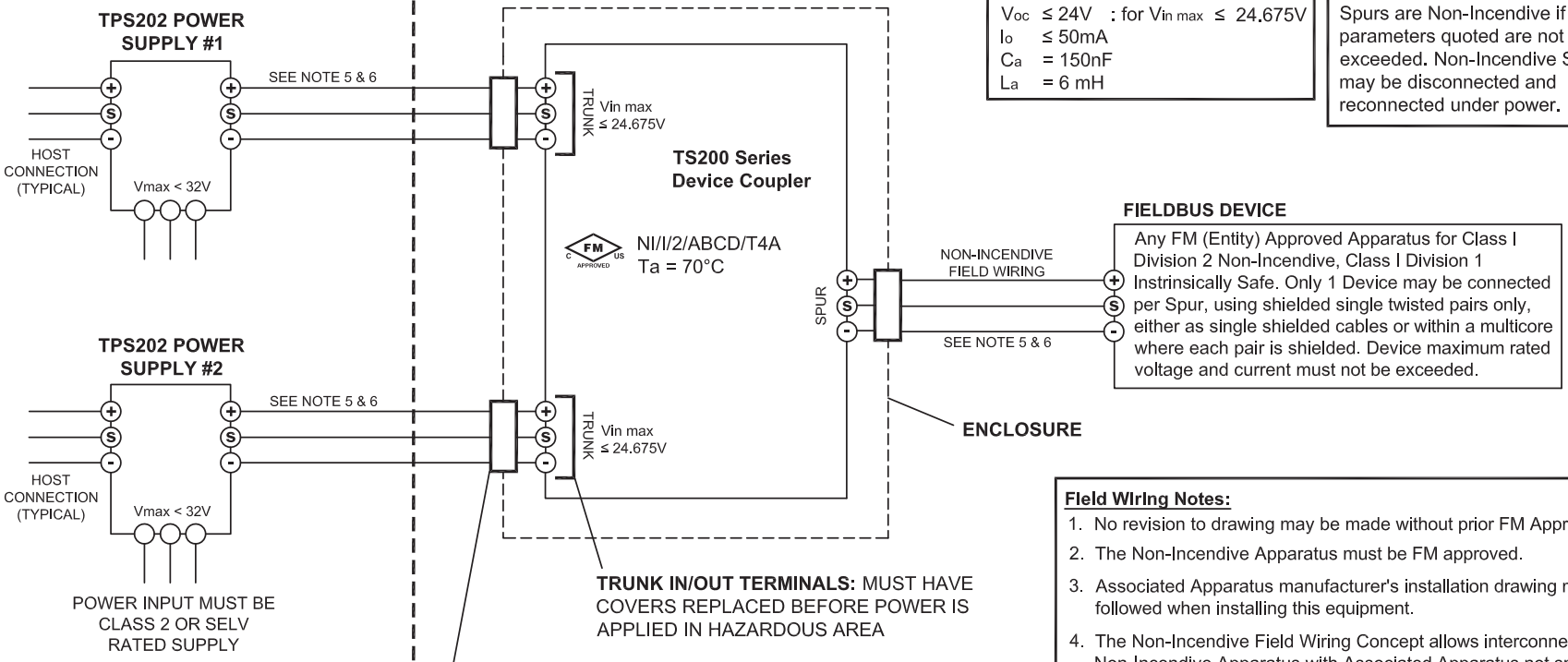
HAZARDOUS LOCATION

CLASS I, DIVISION 2, GROUPS A, B, C & D
-45°C < Ta < +70°C

INSTALLATION SHALL BE CARRIED OUT BY SUITABLY TRAINED PERSONNEL AND IN ACCORDANCE WITH NATIONAL ELECTRICAL CODE (ANSI/NFPA 70) OR CODES OF PRACTICE. USER REPAIR OF TS200 UNITS IS NOT POSSIBLE. **WARNING:** SUBSTITUTION OF ANY COMPONENT MAY IMPAIR SUITABILITY FOR DIVISION 2.

Spur Connections:
V_{oc} ≤ 24V : for $V_{in\ max}$ ≤ 24.675V
I_o ≤ 50mA
C_a = 150nF
L_a = 6 mH

Non-Incendive Connections: Spurs are Non-Incendive if cable parameters quoted are not exceeded. Non-Incendive Spurs may be disconnected and reconnected under power.


TPS202 POWER SUPPLY #1
SEE NOTE 5 & 6
HOST CONNECTION (TYPICAL)
Vmax < 32V
TRUNK
Vin max ≤ 24.675V
TS200 Series Device Coupler
FM APPROVED
NI/I/2/ABCD/T4A
Ta = 70°C
SPUR
NON-INCENDIVE FIELD WIRING
SEE NOTE 5 & 6
FIELDBUS DEVICE
Any FM (Entity) Approved Apparatus for Class I Division 2 Non-Incendive, Class I Division 1 Instrinsically Safe. Only 1 Device may be connected per Spur, using shielded single twisted pairs only, either as single shielded cables or within a multicore where each pair is shielded. Device maximum rated voltage and current must not be exceeded.
TPS202 POWER SUPPLY #2
SEE NOTE 5 & 6
HOST CONNECTION (TYPICAL)
Vmax < 32V
TRUNK
Vin max ≤ 24.675V
ENCLOSURE
POWER INPUT MUST BE CLASS 2 OR SELV RATED SUPPLY
TRUNK IN/OUT TERMINALS: MUST HAVE COVERS REPLACED BEFORE POWER IS APPLIED IN HAZARDOUS AREA
CABLE FITTINGS(S): MUST MAINTAIN IP RATING OF ENCLOSURE IN SERVICE FOR ALL ENTRIES

Certified Product

This is a controlled 'Related' or 'Schedule' drawing. No modifications are permitted without the notification and final approval of the Certification Engineer (related dwgs.) or the Certifying Agency (schedule dwgs.)

WARNING - EXPLOSION HAZARD
DO NOT DISCONNECT AT TRUNK TERMINALS WHEN FLAMMABLE OR COMBUSTIBLE ATMOSPHERE IS PRESENT

Field Wiring Notes:

1. No revision to drawing may be made without prior FM Approval.
2. The Non-Incendive Apparatus must be FM approved.
3. Associated Apparatus manufacturer's installation drawing must be followed when installing this equipment.
4. The Non-Incendive Field Wiring Concept allows interconnection of Non-Incendive Apparatus with Associated Apparatus not specifically examined in combination as a system when:
   V_{max} OR $U_i > V_{oc}$, V_t OR U_o; $C_a > C_i + C_{cable}$; $L_a > L_i + L_{cable}$
5. Installation in the U.S. should be in accordance with the National Electrical Code (ANSI/NFPA 70). Division 2 wiring method must be installed as per NEC.
6. Installation in Canada should be in accordance with the latest edition of the C22.1 Canadian Electrical Code, Part I.
7. Any external enclosure shall meet the requirements of ANSI/ISA 61010-1.

MOORE INDUSTRIES

DO NOT SCALE DRAWING

TOLERANCES (UNLESS NOTED)
DECIMALS =±Inch /mm
.X =±.1 /2.54
.XX =±.01 /0.25
.XXX =±.005/0.125
HOLES =±.003/0.080
ANGLES =±1/2°

DRAWN	C. Whan	6/09
CHECKED	See Sht.1	
ENGINEER	See Sht.1	
SCALE	NONE	

CATEGORY: CONTROL DRAWING

TITLE: Field Installation Diagram: TS200 Device Coupler – IECEx – – Legacy [nL] ATEX –

DRAWING NUMBER: 100–100–76 SHEET 2 OF 2

REVISION: B

REVISED BY: SEE SHEET 1 | DATE | BY | APPROVAL

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UNCLASSIFIED AREA | **EXPLOSIVE ATMOSPHERES**

INSTALLATION SHALL BE CARRIED OUT BY SUITABLY TRAINED PERSONNEL AND IN ACCORDANCE WITH THE LATEST EDITIONS OF THE WIRING PRACTICES FOR THE COUNTRY OF ORIGIN. USER REPAIR OF TS200 UNITS IS NOT POSSIBLE.

Spur Connections:
V_{oc} ≤ 24V : for $V_{in\ max}$ ≤ 24.675V
I_o ≤ 50mA
C_a = 150nF
L_a = 6 mH

Non-Incendive Connections: Spurs are Non-Incendive if cable parameters quoted are not exceeded. Non-Incendive Spurs may be disconnected and reconnected under power.

TPS202 POWER SUPPLY #1

HOST CONNECTION (TYPICAL)

Vmax < 32V

TRUNK

VIn max ≤ 24.675V

TS200 Series Device Coupler

II 3 G Ex nA nC [nL]* IIC T4
FM08ATEX0050X
(*Legacy Product)

SPUR

FIELDBUS DEVICE

Ex n
Ex i

DEVICE MAXIMUM RATED VOLTAGE AND CURRENT MUST NOT BE EXCEEDED

TPS202 POWER SUPPLY #2

HOST CONNECTION (TYPICAL)

Vmax < 32V

IECEx Ex nA nC [nL] IIC T4
FMG 08.0007X

TRUNK

Vin max ≤ 24.675V

CE

POWER INPUT MUST BE CLASS 2 OR SELV RATED SUPPLY

ENCLOSURE: EX E OR EX N OR OTHERWISE SUITABLE FOR CATEGORY 3 G D APPLICATIONS. IP54 MINIMUM FOR GAS HAZARDS. IP6X MINIMUM FOR DUST HAZARDS. MUST BE CLOSED BEFORE USE IN HAZARDOUS AREA.

TRUNK IN/OUT TERMINALS: MUST HAVE COVERS REPLACED BEFORE POWER IS APPLIED IN HAZARDOUS AREA

NO ACCESS TO TRUNK IN/OUT WIRING UNDER POWER IS PERMITTED UNLESS THE AREA IS KNOWN TO BE NON-HAZARDOUS BY (FOR EXAMPLE) LOCAL GAS DETECTION

CABLE FITTINGS(S): MUST MAINTAIN IP RATING OF ENCLOSURE IN SERVICE FOR ALL ENTRIES

IF ANY OTHER CIRCUITS PRESENT: CREEPAGE/CLEARANCE > 1mm BETWEEN ANY WIRING AND GROUNDED METAL AND ANY LIVE PARTS SHROUDED TO IP30 MINIMUM (IF LIVE WHEN ENCLOSURE IS OPENED).

Certified Product

This is a controlled 'Related' or 'Schedule' drawing. No modifications are permitted without the notification and final approval of the Certification Engineer (related dwgs.) or the Certifying Agency (schedule dwgs.)

MOORE INDUSTRIES

DO NOT SCALE DRAWING

TOLERANCES (UNLESS NOTED)
DECIMALS ±inch /mm
.X ±.1 /2.54
.XX ±.01 /0.25
.XXX ±.005/0.125
HOLES ±.003/0.080
ANGLES ±1/2°

DRAWN	C. Whan	9/13
CHECKED	V.Garcia	9/13
ENGINEER	W. Tchan	9/13
SCALE	NONE	

CATEGORY: CONTROL DRAWING

TITLE: **Installation Diagram: TS200-DIN-ATEX SERIES [ic] Zone 2**

DRAWING NUMBER: 100-100-79

REVISION: A

REVISED BY	DATE	BY	APPROVAL
ECO 16973	10/13	CW	CB

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Non-Hazardous Area

TPS202 Power Supply #1
Host connection (typical)
+ S –
Vmax < 32V
Power input must be Class 2 or SELV rated supply

TPS202 Power Supply #2
Host connection (typical)
+ S –
Vmax < 32V
Power input must be Class 2 or SELV rated supply

Hazardous Area / Explosive Atmosphere

Ex II 3 G Ex nA nC [ic] IIC T4 (Zone 2)

-- WARNING --
Substitution of components may impair Intrinsic Safety. To prevent ignition of flammable or combustible atmospheres, disconnect power before servicing.

Fieldbus Device (Typical)
Ex n
Ex i
3
– S +
4 External Enclosure
8 2
9 2
5
TRUNK A
TRUNK B
TS206-DIN-ATEX
2 8

Entity Parameters	
Spur Connections (+ S -)	Uo = 24Vdc Io = 50mA Co = 220nF Lo = 6mH
Operating Temperature Range: -40°C ≤ Tamb. ≤ +70°C	
Must use +75°C suitable wiring	

Installation may only be carried out by suitably trained personnel and in accordance with national wiring regulations or codes of practice.

Where English is not a language of the Country in which the equipment is being used, please apply to Moore Industries International, Inc. (MII) for a suitable translation.

Certified Product
This is a controlled 'Related' or 'Schedule' drawing. No modifications are permitted without the notification and final approval of the Certification Engineer (related dwgs.) or the Certifying Agency (schedule dwgs.)

Installation Notes:

9. If other electrical circuits are fitted into the enclosure, then they shall be suitably approved for the hazardous area of installation and live parts shall be protected to a minimum of IP40 when the enclosure is opened.
8. If other electrical circuits are fitted into the enclosure, then they shall be suitably approved for the hazardous area of installation and live parts shall be protected to a minimum of IP20 when the enclosure is opened.
7. A minimum clearance of 1 mm between live parts and earthed metal shall be maintained.
6. Access to Trunk In wiring under power is NOT permitted unless the area is known to be Non-Hazardous.
5. Trunk In terminals must have covers replaced before power is applied in Harazardous Area.
4. External enclosure required. Must be suitable for Category 3 G applications, rated IP54 minimum and must be closed before use in Haradous Area.
3. The device must be certified Ex n or Ex i and it's maximum rated voltage and current must NOT be exceeded.
2. Cable fittings must maintain IP rating of enclosure in service for all entries.
1. Installation shall be in accordance with the latest editions of the wiring practices for the country of origin and EN 60079-14.

HOST Interface Kits

The table below shows the interface adapters, redundant adapters, and cables needed for installation for your specific system. Refer to appendices for examples of system configurations.

Table. *Moore Industries Interface options*

	Emerson	Invensys	Yokogawa	Generic (ABB, SMAR, Rockwell, Honeywell)	Profibus
Kit Number	804-905-27	804-906-27	804-907-27	804-904-27	804-908-27
Cable (from Carrier to Interface Adapter)	Not required	2 x 804-011-26	804-009-26	2 x 804-009-26 804-013-26*	2 x 804-009-26
Interface Adapter	Not required	2 x 804-866-27	2 x 804-867-27	2 x 804-867-27	2 x 804-867-27
Redundant Adapter	2 x 804-858-27	804-864-27	804-869-27	804-861-27	804-868-27

* Use with Honeywell with alarm connections from Redundant Adapter to H1 Card.

Appendix A: TRUNKSAFE/ Emerson DeltaV System Configuration

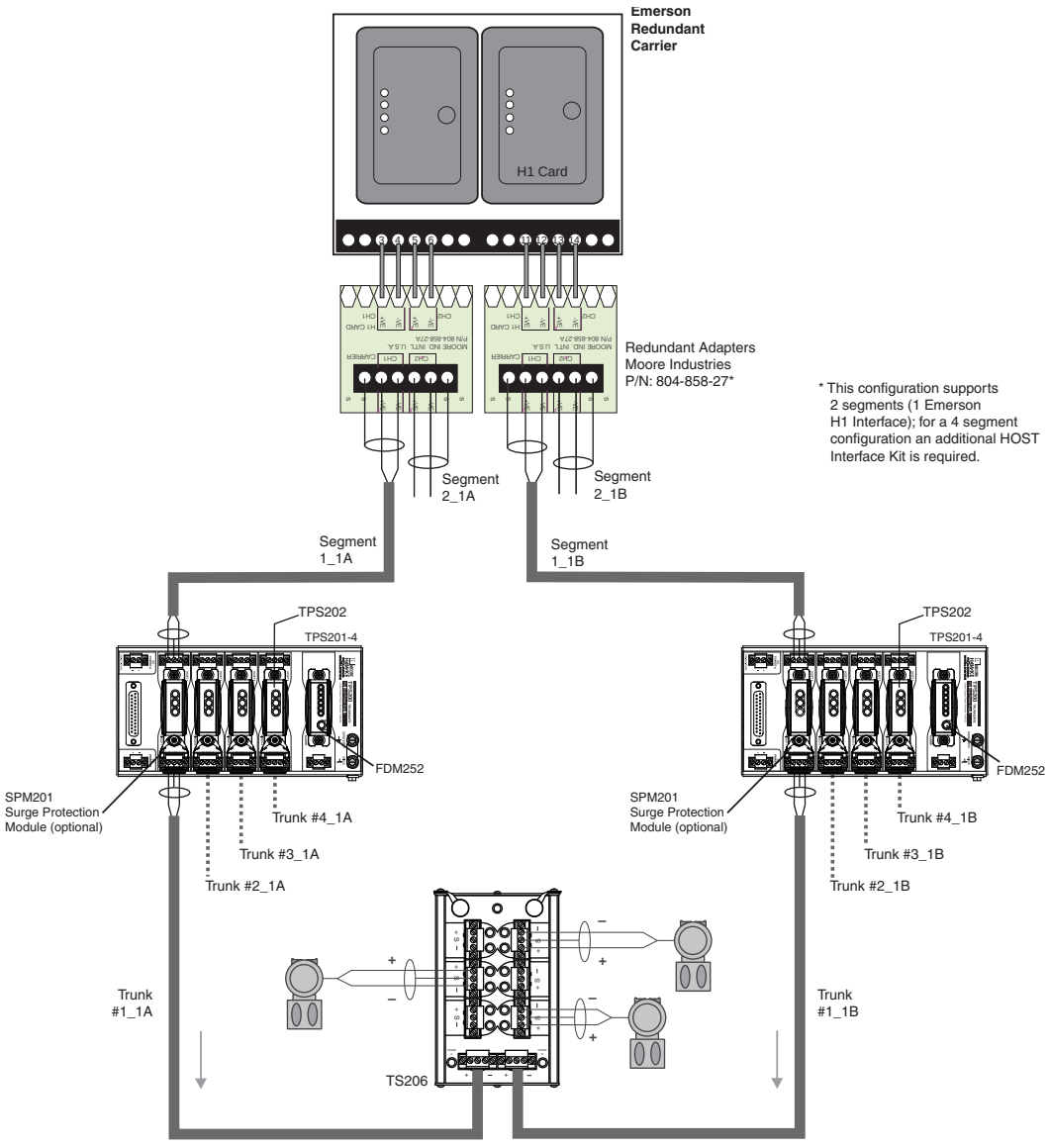
DeltaV is a digital automation system from Emerson Process Management. DeltaV incorporates FOUNDATION Fieldbus I/O capability via H1 cards. Redundant H1 cards are supported if using a DeltaV Series 6.0 or later which utilizes Series 2 H1 cards.

TRUNKSAFE can also be connected with the same HOST Interface Kit to the new S-Series H1 I/O cards (provided they do not have integrated power).

The redundant adaptor fits directly onto the Emerson Redundant Carrier terminals and makes independent terminals available for both redundant segments: Trunk1_1A, Trunk1_1B, Trunk 1_2A and Trunk 1_2B (refer to Figure A-2). This allows each trunk to be connected to the selected pair of TPS202 Advanced Power Conditioners, which may be on the same, or separate, TPS201-4 DIN Carriers, as required. Refer to Figure A-1 for an example of splitter operation.

To install TRUNKSAFE with an Emerson DeltaV system, refer to Figure A-1 below.

Figure A-1. *TRUNKSAFE / Emerson DeltaV System Configuration*

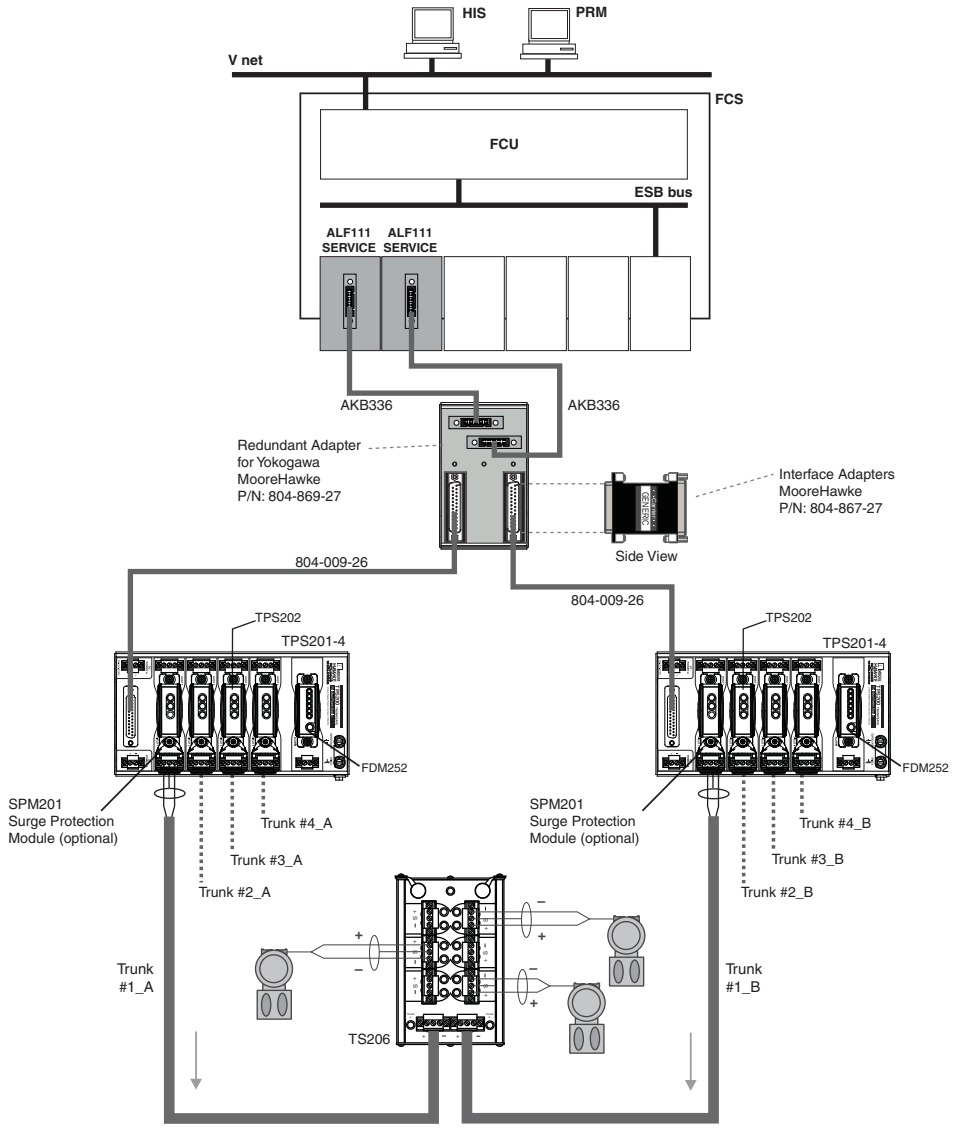


Appendix B: TRUNKSAFE / Yokogawa CENTUM System Configuration

Yokogawa CENTUM Systems can be connected using the 804-869-27 Redundancy Adapter. The connections between the ALF111 and the Redundancy Adapter are completed with the Yokogawa supplied AKB336 cables. The connections between the Redundancy Adapter and the TRUNKSAFE TPS201-4 are completed with Moore Industries supplied DB25 cables, P/N 804-009-26. The standard length of the DB25 cables is six feet. Longer cable lengths can be provided upon special request. The maximum allowable length of each DB25 cable connection is 30 meters (~100 feet).

One DB25 (804-009-26) cable carries four segments from one ALF111 (1A, 2A, 3A, 4A) and the other DB25 (804-009-26) cable carries the other side of the redundant pair (1B, 2B, 3B, 4B) from the standby ALF111. Two TPS201-4 DIN Carriers then automatically support the 4 pairs of segment trunk cables. Refer to Figure A-2 for system confi guration.

Figure A-2. *TRUNKSAFE / Yokogawa CENTUM System Configuration*

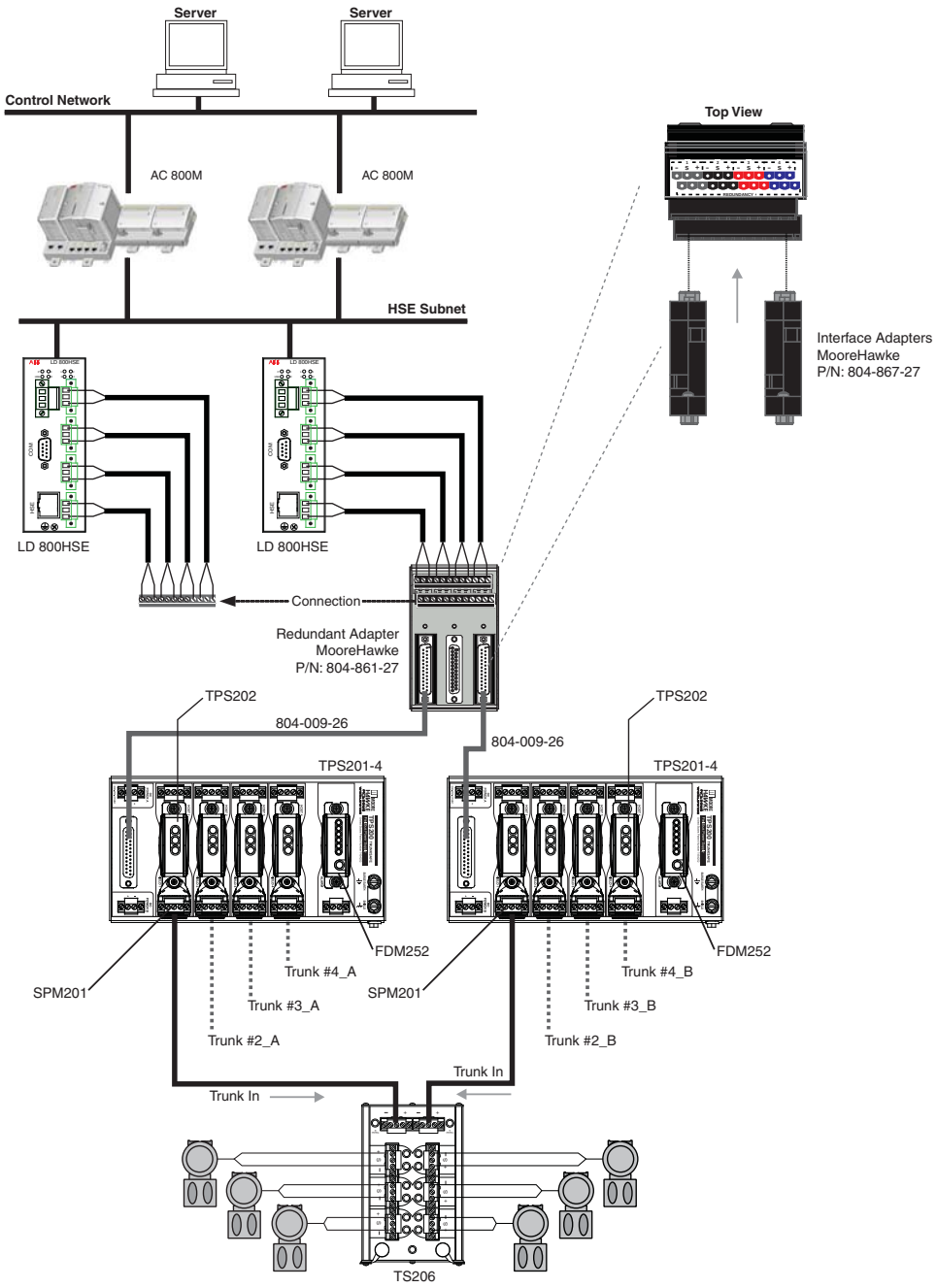


Appendix C: TRUNKSAFE/ ABB System 800 Configuration

TRUNKSAFE can be wired to each channel at the LD 800HSE linking device using 804-861-27 redundant adapter. Then connect the TPS201-4 to redundant adapter using 804-009-26 cable one per TRUNKSAFE unit.

Refer to Figure A-3 for installation instructions.

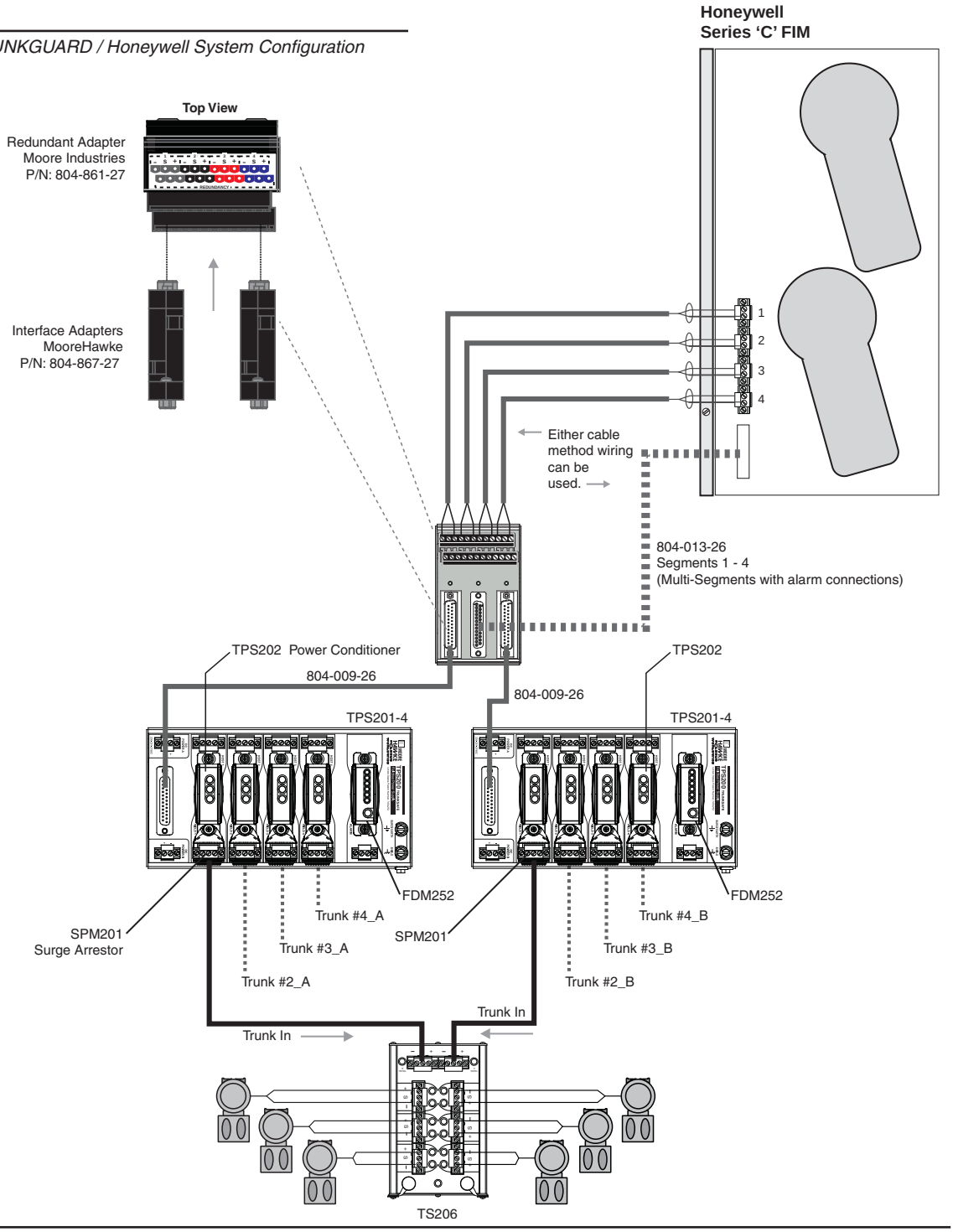
Figure A-3. *TRUNKSAFE / ABB System 800 Configuration*



Appendix D: TRUNKSAFE/ Honeywell System Configuration

To utilize TRUNKSAFE with a Honeywell system, refer to Figure A-4 below.

Figure A-4. *TRUNKGUARD / Honeywell System Configuration*

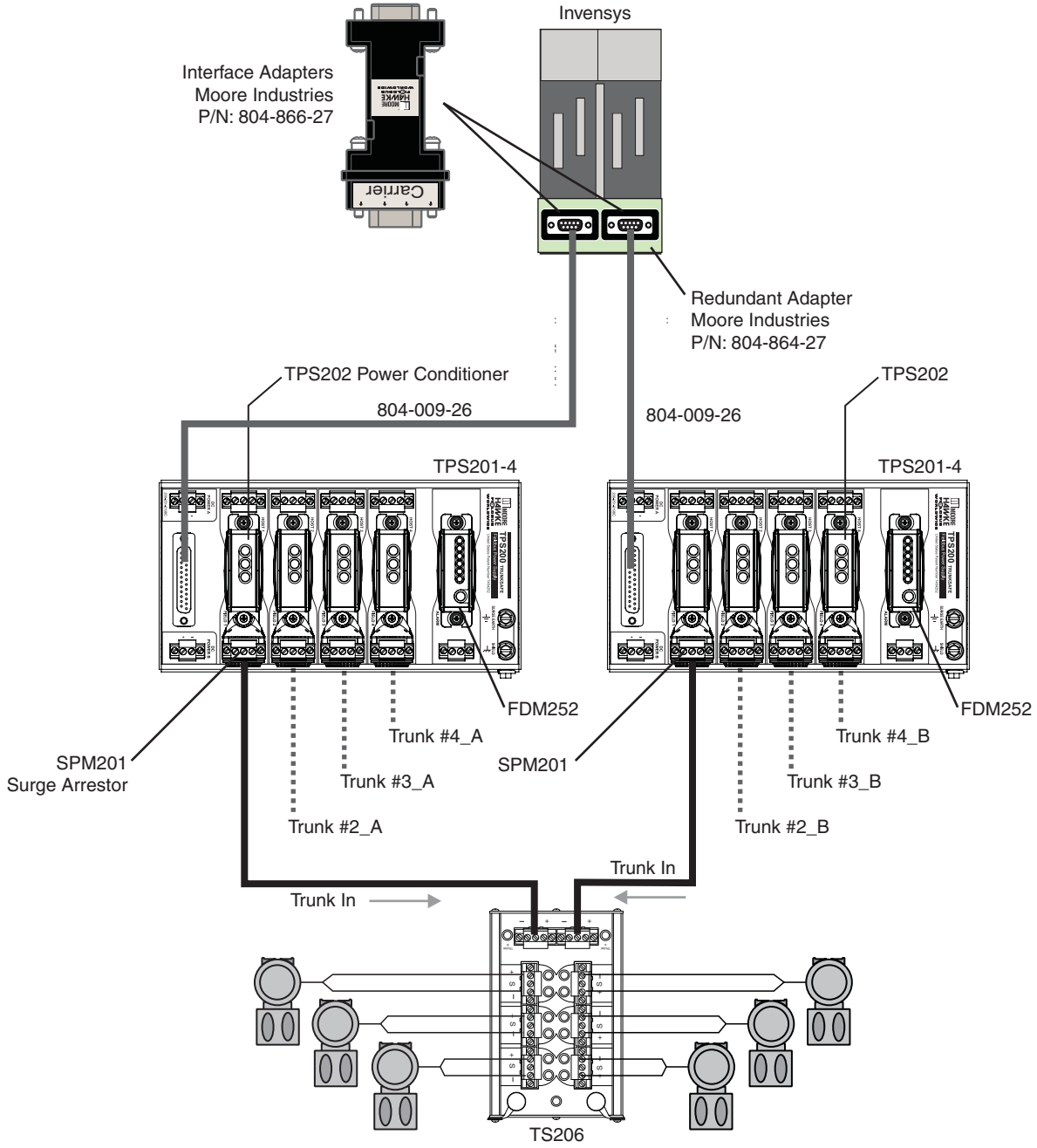


Appendix E: TRUNKSAFE/ Invensys System Configuration

To utilize TRUNKSAFE with a Invensys system, refer to Figure A-5 below.

The Redundant adapter mounts directly on the I/A System carrier board. The interface adapters mount on the redundancy adapter and can be independently removed during operation. The interface adapter circuit is comprised of a passive diode network and series capacitors.

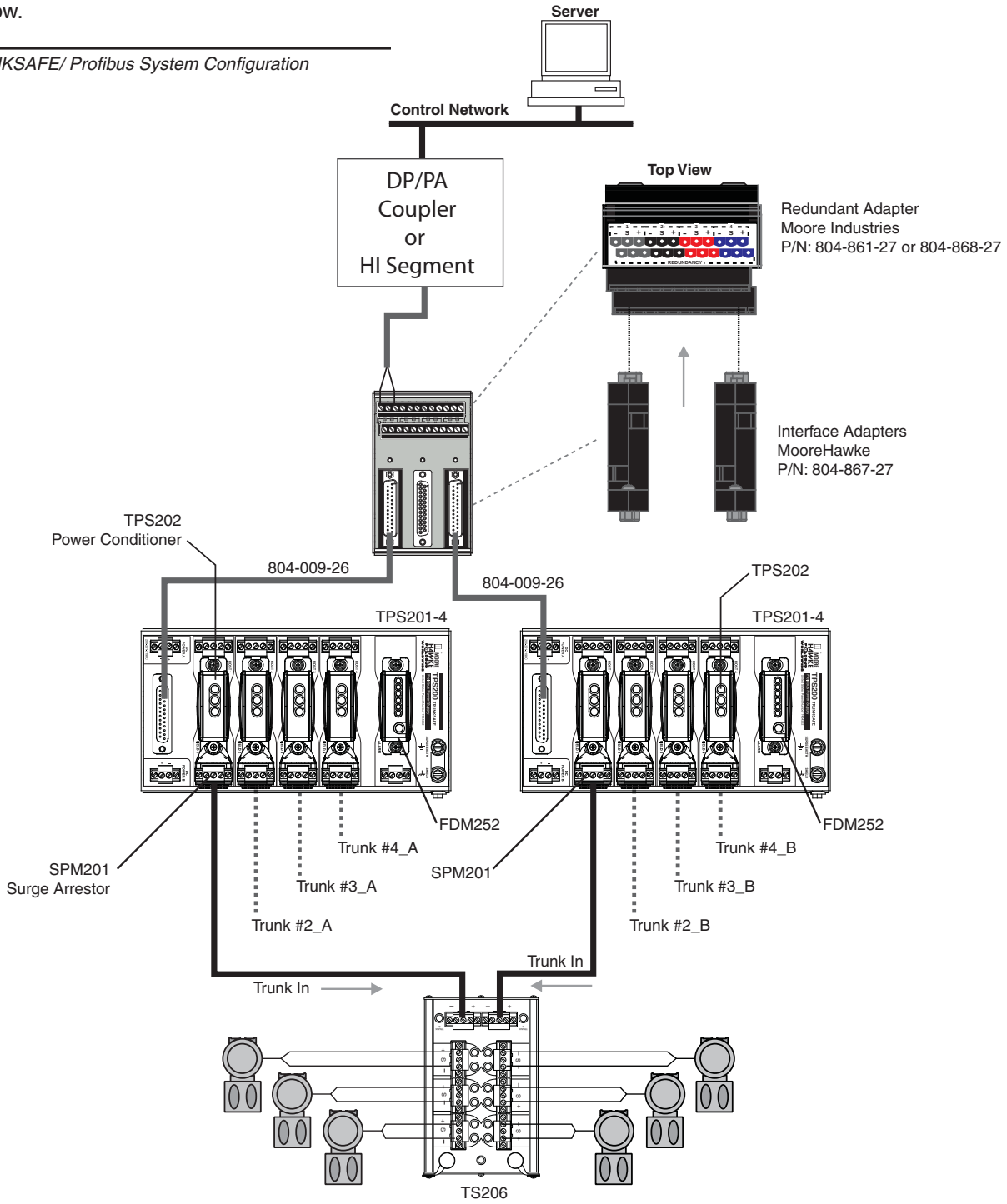
Figure A-5. *TRUNKGUARD / Invensys System Configuration*



Appendix F: TRUNKSAFE/ Profibus PA or any Host with non-redundant H1 Cards

To utilize TRUNKSAFE with a Profibus system, refer to Figure A-6 below.

Figure A-6. *TRUNKSAFE/ Profibus System Configuration*



EC Declaration of Conformity

Moore Industries-International, Inc.
16650 Schoenborn Street
North Hills, CA 91343-6196 U.S.A.

Equipment Description:

TRUNKSAFE Series Fieldbus Device Coupler
Model TS2 / * / * / * / * / -ATEX
* Indicates enclosure, spurs, gland type, gland size and options as stated in the product data sheet.

Directive:

2004/108/EC (EMC: Electromagnetic Compatibility)

Specifications Conformed To:

EN 61326-1:2006 Electrical equipment for measurement, control and laboratory use - EMC requirements

---

Equipment Description:

TRUNKSAFE Series Fieldbus Device Coupler
Model TS2 / * / * / * / * / -ATEX
* Indicates enclosure, spurs, gland type, gland size and options as stated in the product data sheet.

Directive:

94/9/EC (ATEX: Equipment and protective systems for potentially explosive atmospheres)

Provisions of the Directive Fulfilled by the Equipment:

Group II Category 3 G Ex nA nC [ic] IIC T4 (Ta -40˚C to +70˚C)

Technical File No.: **TS200-TF001**

Conformity Assessment Procedure:

Internal Control of Production - Annex VIII (Module A)

Technical Standards Referenced:

EN 60079-0:2009 Explosive atmospheres Part 0: Equipment - General requirements
EN 60079-11:2012 Explosive atmospheres Part 11: Equipment protection by intrinsic safety ”i”
EN 60079-15:2011 Explosive atmospheres Part 15: Equipment protection by type of protection ”n”

On Behalf of Moore Industries-International, Inc., I declare that, on the date the equipment accompanied by this declaration is placed on the market, the equipment conforms with all technical and regulatory requirements of the above listed directives.

Signature:

Deanna Esterwold, Quality Manager

EC Declaration of Conformity

Moore Industries-International, Inc.
16650 Schoenborn Street
North Hills, CA 91343-6196 U.S.A.

Date Issued: 03 Oct. 2013
No. 100-100-237 Rev. A

Equipment Description:

TRUNKSAFE Series Fieldbus Device Coupler
Model TS2 / * / * / * / * / *
* Indicates enclosure, spurs, gland type, gland size and options as stated in the product data sheet.

Directive:

2004/108/EC (EMC: Electromagnetic Compatibility)

Specifications Conformed To:

EN 61326-1:2006 Electrical equipment for measurement, control and laboratory use - EMC requirements

---

Equipment Description:

TRUNKSAFE Series Fieldbus Device Coupler
Model TS2 / * / * / * / * / *
* Indicates enclosure, spurs, gland type, gland size and options as stated in the product data sheet.

Directive:

94/9/EC (ATEX: Equipment and protective systems for potentially explosive atmospheres)

Provisions of the Directive Fulfilled by the Equipment:

Group II Category 3 G Ex nA nC [nL] IIC T4 (Ta -40˚C to +70˚C)

Type Examination Certificate:

FM 08 ATEX 0050 X

Technical Standards Referenced:

EN 60079-0:2006 Explosive atmospheres Part 0: Equipment - General requirements
EN 60079-15:2005 Explosive atmospheres Part 15: Equipment protection by type of protection ”n”

On Behalf of Moore Industries-International, Inc., I declare that, on the date the equipment accompanied by this declaration is placed on the market, the equipment conforms with all technical and regulatory requirements of the above listed directives.

Signature:

Deanna Esterwold, Quality Manager

RETURN PROCEDURES

To return equipment to Moore Industries for repair, follow these four steps:

1. Call Moore Industries and request a Returned Material Authorization (RMA) number.

Warranty Repair –

If you are unsure if your unit is still under warranty, we can use the unit's serial number to verify the warranty status for you over the phone. Be sure to include the RMA number on all documentation.

Non-Warranty Repair –

If your unit is out of warranty, be prepared to give us a Purchase Order number when you call. In most cases, we will be able to quote you the repair costs at that time. The repair price you are quoted will be a "Not To Exceed" price, which means that the actual repair costs may be less than the quote. Be sure to include the RMA number on all documentation.

2. Provide us with the following documentation:
   a) A note listing the symptoms that indicate the unit needs repair
   b) Complete shipping information for return of the equipment after repair
   c) The name and phone number of the person to contact if questions arise at the factory

3. Use sufficient packing material and carefully pack the equipment in a sturdy shipping container.

4. Ship the equipment to the Moore Industries location nearest you.

The returned equipment will be inspected and tested at the factory. A Moore Industries representative will contact the person designated on your documentation if more information is needed. The repaired equipment, or its replacement, will be returned to you in accordance with the shipping instructions furnished in your documentation.

WARRANTY DISCLAIMER

THE COMPANY MAKES NO EXPRESS, IMPLIED OR STATUTORY WARRANTIES (INCLUDING ANY WARRANTY OF MERCHANTABILITY OR OF FITNESS FOR A PARTICULAR PURPOSE) WITH RESPECT TO ANY GOODS OR SERVICES SOLD BY THE COMPANY. THE COMPANY DISCLAIMS ALL WARRANTIES ARISING FROM ANY COURSE OF DEALING OR TRADE USAGE, AND ANY BUYER OF GOODS OR SERVICES FROM THE COMPANY ACKNOWLEDGES THAT THERE ARE NO WARRANTIES IMPLIED BY CUSTOM OR USAGE IN THE TRADE OF THE BUYER AND OF THE COMPANY, AND THAT ANY PRIOR DEALINGS OF THE BUYER WITH THE COMPANY DO NOT IMPLY THAT THE COMPANY WARRANTS THE GOODS OR SERVICES IN ANY WAY.

ANY BUYER OF GOODS OR SERVICES FROM THE COMPANY AGREES WITH THE COMPANY THAT THE SOLE AND EXCLUSIVE REMEDIES FOR BREACH OF ANY WARRANTY CONCERNING THE GOODS OR SERVICES SHALL BE FOR THE COMPANY, AT ITS OPTION, TO REPAIR OR REPLACE THE GOODS OR SERVICES OR REFUND THE PURCHASE PRICE. THE COMPANY SHALL IN NO EVENT BE LIABLE FOR ANY CONSEQUENTIAL OR INCIDENTAL DAMAGES EVEN IF THE COMPANY FAILS IN ANY ATTEMPT TO REMEDY DEFECTS IN THE GOODS OR SERVICES , BUT IN SUCH CASE THE BUYER SHALL BE ENTITLED TO NO MORE THAN A REFUND OF ALL MONIES PAID TO THE COMPANY BY THE BUYER FOR PURCHASE OF THE GOODS OR SERVICES.

ANY CAUSE OF ACTION FOR BREACH OF ANY WARRANTY BY THE COMPANY SHALL BE BARRED UNLESS THE COMPANY RECEIVES FROM THE BUYER A WRITTEN NOTICE OF THE ALLEGED DEFECT OR BREACH WITHIN TEN DAYS FROM THE EARLIEST DATE ON WHICH THE BUYER COULD REASONABLY HAVE DISCOVERED THE ALLEGED DEFECT OR BREACH, AND NO ACTION FOR THE BREACH OF ANY WARRANTY SHALL BE COMMENCED BY THE BUYER ANY LATER THAN TWELVE MONTHS FROM THE EARLIEST DATE ON WHICH THE BUYER COULD REASONABLY HAVE DISCOVERED THE ALLEGED DEFECT OR BREACH.

RETURN POLICY

For a period of thirty-six (36) months from the date of shipment, and under normal conditions of use and service, Moore Industries ("The Company") will at its option replace, repair or refund the purchase price for any of its manufactured products found, upon return to the Company (transportation charges prepaid and otherwise in accordance with the return procedures established by The Company), to be defective in material or workmanship. This policy extends to the original Buyer only and not to Buyer's customers or the users of Buyer's products, unless Buyer is an engineering contractor in which case the policy shall extend to Buyer's immediate customer only. This policy shall not apply if the product has been subject to alteration, misuse, accident, neglect or improper application, installation, or operation. THE COMPANY SHALL IN NO EVENT BE LIABLE FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES.

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